Insights

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Ontario Forest Research Institute
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New information on plant competition will improve early conifer survival, growth

By Abigail M. Obenchain

If you walk through a hectare of young forest, you will likely see several thousand trees. Walk through that same area 70 years later, and you may see less than 500 trees. Why? In large part, it's due to *competition*. The trees that survive will be the ones that compete successfully with other trees and plants for a limited supply of light, water, and nutrients; the rest will return to the soil.

According to OFRI scientist Wayne Bell and former OFRI scientist Bob Wagner, now with the University of Maine, understanding how plants compete is critical to ensuring sustainability, whether your objective is to promote the growth of trees for fibre production, restore threatened tree species to their former ecological range, and/or to minimize impacts on other values like wildlife habitat, biodiversity and ecotourism.

"In the past, vegetation management was based on relatively simplistic ideas," Wagner explains. "We knew very little about how plants compete – or how and when to control them. Through learning how various competitor plants affect trees, we are developing much more efficient, cost-effective, and ecologically sound methods to manage plant competition and work toward our forest-management objectives."

The following 4 articles profile OFRI projects that are shedding new light on managing plant competition.

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In this issue . . .

The latest results of OFRI's plant competition studies 1

International forestry experts to speak at conference in the Sault 4

Adaptive management: linking research and operations 5

New GIS tools for managing research sites and analyzing landscapes 6

Upcoming events 8

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Landmark study reveals which species are the most competitive – and why

At the OFRI Arboretum in Sault Ste. Marie, you can see an innovative approach to determining which plant species are the most serious competitors in young boreal forests, says OFRI scientist Wayne Bell.

In this 6-year project, scientists are comparing how 9 herbaceous and woody competitors, planted at 6 densities, affect the growth of black spruce and jack pine on sandy, loam, and clay soils. The competitors studied include large-leaved aster, Canada bluejoint grass, fireweed, bracken fern, red raspberry, upland willow, green alder, white birch, and trembling aspen. The study is also looking at how black spruce and jack pine compete with each other. Bell

Continued on Page 2

explains that black spruce is of special concern, because this valuable commercial species has been declining significantly in the boreal forest. According to MNR's *Report on the Status of Forest Regeneration*, which describes the results of an independent forest regeneration audit conducted in 1992, *competition* is at least partly responsible for this decline.

The results of the Arboretum study may help reverse this decline by providing forest managers with a stronger scientific foundation on which to base vegetation management strategies. Results to date, according to Bell and Wagner, include the following:

- **Herbaceous species** appear to reach their maximum density much more quickly than woody species (except raspberry) and are far more competitive on clay soil than sand. Effects of the **woody competitors** are just starting to show.
- A heavy density of **large-leaved aster** will kill all jack pine growing on clay by showering the trees' needles with spores of *Coleosporeum asterum*, a needle rust (see photos). At lower densities, the aster results in some infection but the pines don't die. Black spruce are not affected by this fungi.
- A single **fireweed** stem can multiply into about 140 stems within a year. By the fourth year of this study, all the fireweed plots contained the same density, resulting in nearly 100% mortality of the jack pine. The more shade-tolerant spruce had a higher survival rate (nearly 100% over 4 years), but growth was reduced.
- In the spring, dead foliage of **Canada bluejoint grass** can form a mat that reflects solar radiation so effectively that the soil underneath does not thaw until late spring. This grass also competes with the trees for light, rendering them spindly and susceptible to snowpressing. Bluejoint grass is very hard to remove, Bell says; your best bet is prevention, ideally through treating prior to seed set. Once it's established, you can manage it through mounding and in some cases mulching with large mats.
- **Red raspberry** was almost as prolific. Bell suggests using glyphosate to clean out raspberry before planting and using good stock that will be tall enough to compete when the raspberry comes back (its seeds can remain viable in the soil for up to 150 years).
- With **black spruce**, competition for solar radiation appears to be far more significant for trees growing with grasses/herbs than for those growing with deciduous broad-leaved competitors.
- To compete successfully for nitrogen, **jack pine** appears to rely on efficient nitrogen use rather than rapid uptake. This study also indicates that jack pine can grow surprisingly well on clay, especially in the absence of competition.

Scientists have also learned that in areas with low to medium densities of competition, Kodak digital cameras can be used to separate crop trees from competitors and spruce from pine. "Using this remote-sensing technology may prove to be less expensive than using crews on the ground, and it will help resource managers target their vegetation management strategies more precisely," Bell says.

Project contacts: Wayne Bell, OFRI; Bob Wagner, University of Maine. Project partners: Steve Colombo, Tim Meyer, Gina Mohammed, Tom Noland, Paul Sampson, and Michael Ter-Mikaelian, OFRI; Canadian Forest Service, Sault Ste. Marie; University of Guelph, Guelph, Ontario; Carleton University, Ottawa; York University, North York, Ontario; Tharandt University, Dresden, Germany; University of Missouri, Columbia, Missouri, USA.

According to new OFRI research, jack pine seedlings cannot survive heavy densities of large-leafed aster, a carrier of Coleosporeum asterum. *This fungus appears on aster leaves as an orange powder (top photo). When the spores drift onto nearby jack pine seedlings, they girdle and kill the needles, damaging or even killing the trees (bottom).*

New information on competitors could aid natural regeneration of white pine

The stately eastern white pine, Ontario's provincial tree, is revered for its beauty and economic value. However, decades of fire suppression and non-sustainable harvesting practices have greatly reduced the natural regeneration of this species, say OFRI scientists Wayne Bell and Bill Parker. "Historically, white pine experienced regular, light fires that kept the competition in check," Bell explains. "However, with fire suppression and the use of logging practices that favour competitors, white pine has not been able to regenerate and has been gradually replaced by balsam fir, maple and other species."

In 1994, Bell and Parker began a 5-year study near Thessalon to determine which of 3 common competitors interferes most with white pine regeneration – and *how* these species conduct their physiological

"warfare." "The *how* is critical," Bell maintains. "Right now, we have very little scientific information on the relative competitiveness of any plant species. By learning which species pose the greatest threat and why, we can help forest managers develop vegetation control strategies that optimize the growth of the desired species. They won't be spending a lot of time and money trying to control species that aren't doing any harm, or worse, inadvertently managing vegetation in a way that actually favours the growth of more competitive species."

"This information gap is especially wide for species like white pine growing in shelterwoods," Parker adds. "What little research has been done on the physiological effects of competition on Ontario's trees has focussed mainly on boreal species in clearcuts."

In the Thessalon study, the 3 competitors under study are balsam fir, beaked hazel, and bracken fern. The study site, a conifer shelterwood, was harvested in 1985; basal area was reduced 50-60%. In 1995, 25 white pine seedlings per 15 x 15 m plot were planted to: 1) ensure enough seedlings were available to continue the study in the face of up to 65% mortality of the naturally regenerated white pine, due largely to rabbit browsing early in the study, and 2) enable the researchers to compare survival and growth rates of natural regeneration vs. planted seedlings. Results to date (final measurements will be taken this year):

- White pine advance regeneration responds well to early release with brushsaws (used for this study because they are the public's preferred alternative to herbicides). According to Parker, seedling photosynthesis acclimated to the higher light levels within 30-60 days of release. Despite this relatively rapid acclimation, seedling height and diameter did not increase significantly for 2 years after release. Parker believes that during this time, the trees were putting much of their energy into root development.
- Competition for light is the primary factor affecting white pine regeneration in this ecosystem, Parker says. Thus balsam fir, which casts the densest and most continuous shade, is the most effective of the 3 competitors at depressing the photosynthetic rate and growth/survival of the pine. Virtually no white pine natural regeneration was found under fir; the few container seedlings that survived planting under fir were stunted and spindly. Beaked hazel, which also has a high leaf area index, was a close second in suppressing the white pine, while bracken fern was less of a problem. "The canopy of bracken fern is more open, thus its effects on white pine photosynthesis and growth are not as great," Parker explains.

What do these results mean for white pine management? "To regenerate white pine in these types of ecosystems, you have to consider controlling the fir and the hazel, depending on their abundance," Parker says.

Bell recommends pre-harvest understory burns. He concludes, "These results could have implications for old-growth management. If we want to ensure that old-growth white pine stands regenerate into young white pine stands rather than fir, then we may need to look at using prescribed burns to control the fir and hazel and prepare a proper seedbed."

Bell and Parker also hope that this study will provide a more precise scientific basis for "free-to-grow" standards. To that end, they are working on relating competitors' percent cover to the amount of light they garner. "It may well be that light-use efficiency is more relevant than plant size to white pine's 'free-to-grow' status," Bell says.

Project contacts: Wayne Bell and Bill Parker, OFRI. Project partners: Michael Ter-Mikaelian, OFRI; MNR Southcentral Science and Technology Development Unit, North Bay; University of Helsinki, Finland.

The "when" is critical to successful vegetation management

When it comes to managing vegetation, timing is everything.

"In the past, woody rather than herbaceous vegetation has been perceived as the major competitive threat to Ontario's young trees," asserts former OFRI scientist Bob Wagner. "However, in a 5-year study near Searchmont, Ontario, we've discovered that reducing herbaceous vegetation during a tree's first few years of life is far more important than had been previously assumed.

"Although the herbs did not reduce tree height growth or survival, they decreased stem volume by up to 70% over 5 years. A decrease of this magnitude will significantly affect the trees' ability to achieve 'free-to-grow' status, thus reducing regeneration success."

The Searchmont study was innovative, Wagner says, because one of its objectives was to determine the *critical-period thresholds* (CPTs) of 4 conifer species: white, red, and jack pine and black spruce. In agricultural crops, CPTs have been studied widely; until recently, however, no such research had been done for North American *tree* species. Wagner explains that a CPT begins when weeds begin to reduce the growth of the desired species and ends when the desired species has suffered the maximum amount of damage. Clearly, timing weed control to coincide with the trees' CPT is the most efficient approach.

He continues, "The results of this study indicate that tree seedlings do have CPTs, but the negative effect of competition begins almost immediately, meaning that the competitor plants begin to influence the growth of desired trees as soon as they are planted.

"In addition, we found that if you can afford to manage vegetation only once,

doing so during the first growing season will provide the greatest benefit."

Another interesting result: *Early* vegetation management on black spruce and white pine may be more worthwhile than was previously thought, despite their relatively late successional status. "These species responded even more aggressively to early vegetation management than did the jack pine and red pine, which we assumed would be much more sensitive to competition," Wagner says.

He concludes: "The results of this research will help forest managers reduce costs and improve regeneration results by helping them to manage vegetation only when it provides the greatest benefit."

Project contact: Bob Wagner, University of Maine. Project partners: Gina Mohammed and Tom Noland, OFRI.

Can we predict which seedlings can handle competition?

In 1992, OFRI scientists Gina Mohammed and Tom Noland began to examine whether they could develop a simple, practical physiological test for assessing whether a batch of seedlings can handle competition from other plants. According to Mohammed, "We already knew that a plant's ability to cope with one stress often prepares it to withstand other stresses. For example, drought tolerance is associated with tolerance of low and high temperatures. In practical terms, this suggests that when using a lab stress test to forecast a plant's ability to cope in the field, you may not need to evaluate every environmental stress a plant may encounter in the presence of competition."

As a result, Mohammed and Noland began 2 studies to evaluate whether *chlorophyll fluorescence* testing could indicate conifer seedlings' ability to withstand competition. The experiments consisted of:

- Subjecting jack pine and black spruce seedlings to hot, dry conditions in a laboratory.
- Assessing the trees' physiological response to the stress 1 day later by measuring the amount and pattern of red light emission in the form of chlorophyll fluorescence.
- Determining the relationship between the seedlings' response to this stress and their response to competition over 5 years after outplanting at the OFRI Arboretum or a recently harvested site near Searchmont, Ontario.

International forestry leaders to keynote vegetation management conference

In August 1998, many of the world's forestry experts will gather in Sault Ste. Marie for the Third International Conference on Forest Vegetation Management. According to former OFRI scientist and conference co-chair Bob Wagner, 7 internationally prominent forest research scientists have agreed to be keynote speakers. The speakers and their topics:

- Dr. Gordon Baskerville, University of British Columbia: *The history of Canadian forestry*
- Dr. Chadwick Oliver, University of Washington, Seattle: *Influences of alternative silvicultural approaches on vegetation management practice*
- Dr. Joel Brown, CSIRO Davies Laboratory, Queensland, Australia: *Approaches to vegetation management in tropical range and agricultural systems*
- Dr. David Perry, Oregon State University, Corvallis: *Effects of vegetation management practices on forest ecosystems*
- Dr. Daniel Botkin, George Mason University, Fairfax, Virginia: *Implications of current ecological theory for forest vegetation management research and practice*
- Dr. John Gordon, Yale University, New Haven, Connecticut: *Implications for forest vegetation management under ecosystem management and other global pressures*
- Dr. Hal Salwasser, USDA Forest Service, Albany, California: *Ecosystem management on U.S. federal lands and its implications for managing forest vegetation*

In addition, about 30 MNR staff will present results of a wide range of vegetation and ecosystem management studies, including the plant competition studies featured in this issue as well as the Fallingsnow Ecosystem Project. Many of these projects will be featured during the in-conference and post-conference tours. Researchers from around the world will present about 190 talks and posters.

Renowned Canadian adventurers, authors, and nature photographers Joanie and Gary McGuffin are scheduled to open the conference with a talk about Canada's magnificent forests, complete with one of their visually stunning slide shows. The McGuffins made headlines last summer when they completed a 1600-km canoe trek through Ontario's ancient forests, beginning at OFRI's Swan Lake Research Reserve in Algonquin Provincial Park.

For more information, contact BioForest Technologies Inc. at (705)942-5824, e-mail ifvmc3@NRCan.gc.ca, or visit http://www.cif-ifc.org/cifweb/ifvmc3/ifvmc3.html.

The results: The seedlings that "glowed" more on Day 1 were found to be more likely to grow better amid competition. Mohammed concludes, "These results indicate that a simple test of the plant's ability to tolerate hot, dry conditions *can be* a useful predictor of its ability to withstand competition."

Noland points out that the 2 studies differed in ways that increased the analytical challenges but allowed them to ensure that this test can be applied in various situations. For example, the Searchmont study allowed them to assess how container and bareroot seedlings of varying genetic origin would perform in "real world" conditions. The Arboretum study looked at container seedlings from a single seed source but in various stock types and sizes. Results from Searchmont indicate that healthy bareroot stock with a well-developed root system appears to be better equipped – both physiologically and morphologically – than container stock to compete with other vegetation. Both studies indicate that with container stock, the larger the seedling, the greater its physiological ability to compete.

However, Noland cautions, "Morphological characteristics like size and root system development do not *always* ensure vigour. When you're making a substantial investment in time and money to regenerate a forest, and the vigour of the seedlings may be in question, this stress test may provide a more complete picture."

According to Noland, the next steps include:

- Using this test to develop a physiological index for predicting and rating the competitive tolerance of seedling stocklots.
- Making the test operational through evaluating its use in field conditions and with other species.

Project contacts: Gina Mohammed and Tom Noland, OFRI. Project partner: Bob Wagner, University of Maine.

Adaptive management:

The future of forest management in Ontario?

By Lisa J. Buse

Adaptive management will help resource managers meet the forest management challenges of the 21st century, asserts OFRI scientist Blake MacDonald, coauthor of the report *Adaptive Forest Management: A Literature Review and Strategic Analysis*, published recently by OFRI. So what is adaptive management, and what are the benefits and challenges?

Adaptive management means learning from experience, but as part of a planned process, MacDonald says. Defined in MNR's *Forest Management Planning Manual* as "management based on continuous learning," adaptive management ensures that:

- Multiple stakeholders are involved in resource management decisionmaking,
- Outcomes of all management options are monitored and assessed based on a given set of objectives or predictions, and
- Management approaches evolve and management options are adjusted based on experience and new information.

This process results in a continuous feedback mechanism, similar to total quality management in business and hypothesis testing in science.

According to the literature, adaptive management approaches include:

- *Reactive*: Changes are driven by external stimuli, including politics, lawsuits, public reactions, and research findings. Example: traditional management. Because the rate of change is faster than the rate of learning, crisis management often ensues.
- *Passive:* The use of monitoring increases learning but slowly because only a single option is tested at a time. Example: Ontario's forest management planning process. It involves public input, objective setting, monitoring and adjustment, but monitoring is limited and modifications may or may not occur.
- *Active*: The learning process is more highly designed. Options are tested simultaneously, rather than sequentially, and scientists and resource managers collaborate more closely.

According to MacDonald, *active* adaptive management should be used in more situations. Benefits include faster learning, improved monitoring of current practices, and the ability to address complex issues in an integrated way. As resource management questions become more complex and the demand for integrated approaches increases, adaptive management becomes more important.

Rob Arnup is research consultant with the Timmins office of Ecological Services for Planning, Ltd., and coauthor of OFRI's adaptive management report. He indicates that adaptive management has been applied to fisheries and wildlife management since the late 1970s but was adopted only recently by forest managers, mainly on the west coast of North America. He cautions that current challenges include:

- Managing risks associated with large-scale management experiments that contravene the traditional preference for a "best practices" approach,
- Resolving experimental-design and statistical issues related to analyzing interactions in complex ecological systems, and
- Getting people to accept the initial high costs and long-term nature of these studies.

Continued on Page 6

How does science fit into adaptive management?

Both scientific research and adaptive management rely on hypothesis testing, experimental design, and data collection and analyses. However, with adaptive management research, resource managers often play a lead role, experiments are at an operational scale, there is less scientific rigour (replication/control), and measurement intensity is reduced, since only key response indicators are monitored. However, Arnup asserts that the closer link between operations and research means more efficient use of limited resources and ensures results are practical. Resource management practices improve more quickly, and scientists gain knowledge about ecosystem components at larger scales.

How can adaptive management be implemented in Ontario?

MacDonald cautions that incorporating adaptive management will occur slowly because it involves such major changes. However, he believes that through melding adaptive management thinking into existing processes, the MNR *can* move steadily toward an active approach. "It will take time to overcome the social and institutional barriers. Strong leadership will be required because there are so many other corporate initiatives competing for people's time and efforts."

Bill Towill, stand dynamics forester with the MNR Boreal Science Section in Thunder Bay, agrees. He emphasizes that adaptive management is a new way of thinking and a new way of doing business – one that needs to become part of everyday practice *before* we can build in science to ensure we get the answers we need.

Where to start

As a first step, MacDonald recommends initiating a few small case studies with groups that are receptive to the idea to show what's possible. "After all," MacDonald

New GIS tool captures 50 years of research at historic reserve in Algonquin Park

By Abigail M. Obenchain

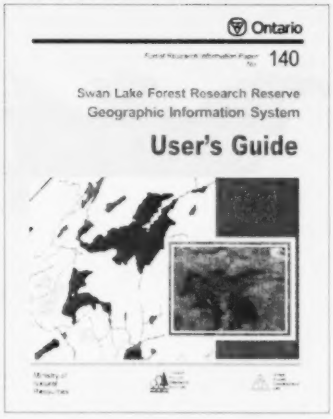
In 1950, the MNR established the Swan Lake Research Reserve in Algonquin Park to allow researchers to study the ecology and management of important hardwood tree species, particularly yellow birch, a valuable commercial species that had declined dramatically due to non-sustainable harvest practices. During the next 50 years, this research resulted in the restoration of yellow birch; the development of uneven-aged management for Ontario's tolerant hardwoods; the advent of ecosystem-based forest research in Ontario in the early '60s; and, more recently, the discovery of 1,000-year-old logs as part of a study that's investigating how to sustain riparian-zone ecosystems (see *Insights* Vol. 1, No. 1).

To protect the MNR's investment in this work, OFRI scientist Bill Cole has developed a GIS-based computer tool that integrates:

- Spatial data from all past and current studies at the reserve
- *Meta data* (data set profiles that include project title, principal investigator, plot locations)
- Site management information (building and road locations, equipment instructions, safety procedures, nearby service points)

According to Cole, this data can be displayed and manipulated using ArcView on a PC and can be exported to other GIS formats.

"This is the future of site management," he asserts. "It will allow us to ensure that historic and current research data is accounted for and accessible, to make much wiser decisions about where to establish new research plots, to link with other research initiatives, both in other geographic areas and across disciplines, and to quickly and easily transfer new resource management information to end users."



He adds that the Swan Lake GIS will be compatible with the MNR's new Natural Resources Values Inventory System and the Algonquin Park GIS (in development). In Phase 2 of this project, scheduled to be completed by the end of the fiscal year '98, spatial plot data will be linked to an annotated bibliography of related publications. If time and funding permit, Phase 3 will involve incorporating actual research data sets into the GIS.

Project contact: Bill Cole, OFRI.
Project partners: Arbex, Ltd., Richmond, Ontario; Algonquin Provincial Park; MNR Southcentral Science and Technology Development Unit.

points out, "people strive to duplicate success."

One potential case study involves harvesting options in the Lake Abitibi Model Forest near Iroquois Falls. For 6 years, Abitibi-Consolidated, Inc., has been working with the Model Forest, OFRI, FERIC, and the Canadian Forest Service to conduct equipment trials to improve harvesting practices. Abitibi management forester Rod Gemmell sees great advantages in a process that encourages continuous learning and improvement. The company has taken the best results from the trials and incorporated them into silvicultural prescriptions and timber management operating plans, and Gemmell is encouraged that the forest management plans are flexible enough to accommodate these changes. Larger changes can be incorporated into the 5-year plans at renewal. The company can request changes to the silvicultural guidelines if it can show the benefits of new approaches.

On lowlands, Abitibi has improved its cutting techniques enough to reduce time between successive harvests, maintain wildlife habitat, and increase aesthetic value, all of which help the company maintain its sustainable forest management standards, Gemmell says.

Towill feels that the place to begin is to apply adaptive management to knowledge gaps in the silvicultural guidelines. He points out that many companies may be facing wood supply shortages, and if the MNR's Lands for Life Round Table discussions result in reduced land for forestry, then companies will have to manage the available land more intensively. Commercial thinning may be one answer to wood supply concerns, he says, but at this point the silvicultural guides do not allow its use because we don't know enough about it.

To help fill this information gap, Towill hopes to embody adaptive management principles in commercial-

Continued on Page 8

LEAP II: A user-friendly tool for analyzing forest landscapes

By Abigail M. Obenchain

OFRI has released the Landscape Ecological Analysis Package v. 2 (LEAP II), the latest in a series of GIS-based decision-support tools for resource managers, planners, and policymakers. According to OFRI landscape ecologist Ajith Perera, LEAP II is a generic tool that allows the user to define the analysis objective; it can analyze landscape patterns and then summarize that information into indices that quantify ecological conditions at various scales, from local to regional.

"For example, LEAP II can determine a landscape's fragmentation, shape, and isolation from neighbors," Perera says. "This type of information is critical to designing resource management strategies, setting reference points for evaluating sustainability, and monitoring and assessing results of management activities and policies over time."

LEAP II is designed to be user-friendly.

According to OFRI systems analyst Frank Schnekenburger, LEAP II is based on the landscape analysis tools LDA (an OFRI product) and FRAGSTATS (developed by the U.S. Forest Service Pacific Northwest Research Station). He adds that LEAP II has been designed to be simple to operate, with a windowed interface (including graphing, charting, and image viewer tools), multiple user levels (basic, intermediate, and advanced), and an integrated program flow guide.

"You don't have to be a GIS expert to use LEAP II," he says. "However, you must have a good understanding of scale, resolution of data, land cover classes, ecological issues, and the validity of the comparisons you make."

LEAP II is now available for Unix (DEC Alpha and Sun workstations) and comes with a comprehensive user's guide. Windows '95 and Windows NT versions will be available in mid-1998. To get LEAP II, MNR staff should contact their systems support staff. Those outside MNR can call OFRI's publication request line at (705)946-2981 x 271.

Project contact: Ajith Perera, OFRI. Project partners: David Baldwin and Frank Schnekenburger, OFRI.

thinning studies he is initiating with forest industry in northwestern Ontario. He says we need to learn *when, where* and *how* to thin; how site, equipment, stand composition, age, density, yield, and wood quality figure into the silvicultural equation; and how various options affect both timber and non-timber values at stand, forest, and landscape scales.

"Using an adaptive management approach, we should be able to outline a framework of what's known and what's needed, and then fund projects that provide the pieces to finish the puzzle in a timely fashion," Towill says. "The end product will be a toolkit of techniques to apply within the forest management planning process."

OFRI's adaptive management contact: Blake MacDonald. Project partners: MNR Boreal Science Section, Timmins/Thunder Bay; Ecological Services for Planning, Timmins; Lake Abitibi Model Forest, Iroquois Falls. To order OFRI's Forest Research Information Paper No. 139, Adaptive Forest Management in Ontario: A Literature Review and Strategic Analysis, *call OFRI's publication request line at (705) 946-2981, x 271, or send an e-mail to: ofriin@gov.on.ca.*

UPCOMING EVENTS

August 24-28, 1998
Third International Conference on Forest Vegetation Management, Sault Ste. Marie (also see Page 4). Cohosted by OFRI and CFS-Great Lakes Forestry Centre. Contact BioForest Technologies Inc. at (705)942-5824, e-mail ifvmc3@NRCan.gc.ca or visit http://www.cif-ifc.org/cifweb/ifvmc3/ifvmc3.html.

September 19-23, 1998
Great Lakes, Great Forests: Society of American Foresters National Convention, Traverse City, Michigan. Visit http://www.safnet.org/conv/main.html or e-mail meetings@safnet.org.

October 6-10, 1998
Planning for the Seventh Generation: 25th Annual Great Lakes Natural Areas Conference, Mackinac Island, Michigan. Visit http://wildlife.dnr.state.mi.us/HomePages/Meetings/Natural _Areas_1998 or call (517)241-2974.

1998 MNR Boreal Science Section workshops:

- *Bird and Frog Monitoring Training Workshops:* Late April/May–Northwest Region, TBA–Northeast Region; for MNR/general public; contact Neil Dawson at (807)939-3120 or Dean Phoenix at (705)235-1241.
- *Growth and Yield Training Session:* Late May/early June; for MNR/forest industry; contact Mark Roddick (807)939-3122.
- *Forest Ecosystem Classification Workshop:* June 23-25; for MNR/forest industry; Kettle Lakes Provincial Park, Timmins; contact Gisele Berry (705)235-1229.
- *Grasses, Sedges, and Rushes:* July 7-8; Kettle Lakes Provincial Park, Timmins; contact Gisele Berry (705)235-1229.
- *Annual Duck Banding:* July 30-31; North Bay; for Ontario duck banding program participants; contact Chris Davies (705)235-1243.
- 1998 NEST Workshop Week: *Sustainable Resources Management – Striking a Balance;* September 21-24; Senator Hotel, Timmins; contact Wally Bidwell (705)235-1236.
- Available on request: *Aquatic Habitat Training Modules*, Steve McGovern (705)235-1211; *River Information Management System,* Chaidih Chang (705)235-1214; *FISHNET v. 2.0,* Mike Fruetel (807)939-3114.

New faces at OFRI

Jean-Noel Candau, *landscape ecology modeller,* is developing models and decision-support tools related to landscape disturbance. Previously, he held a joint post-doctoral position with OFRI and the Canadian Forest Service.

Marilyn Cherry, *forest genetics data analyst,* is conducting statistical analyses and managing the database for the MNR genetic resource management and tree improvement programs. Previously, she worked on forest genetics projects in British Columbia.

Changhui Peng, *forest growth and yield modeller,* is developing computer models for MNR's forest growth and yield program, including customized software applications and decision-support tools. His previous position was with the Canadian Forest Service in Alberta.

Jim Rice, *boreal silviculture research forester,* is working with the boreal mixedwood silviculture research team. A not-so-new face, he has worked for MNR for many years, most recently with the forest growth and yield program.

Have a suggestion?
Want more information on a research project?

We want to hear from you!

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